Pigs and Prairies: Evaluating the Biodiversity Impacts of Prairie Restoration for Biogas Production

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Objective: Evaluate the impact of prairie restoration on biodiversity associated with renewable energy development; specifically, natural gas production through anaerobic digestion of hog manure and plant material.

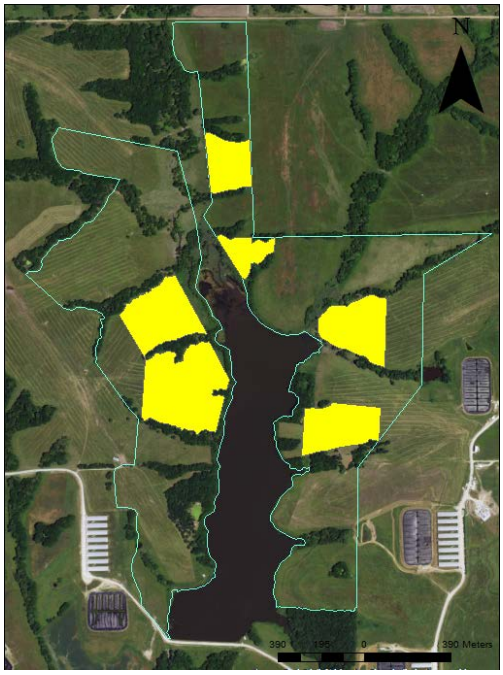

Fig. 1. Ruckman Farm research site, owned and operated by Smithfield Foods, with existing fescue-brome control blocks highlighted in yellow.

Preliminary Assessment: Before treatments were established at the research site, we assessed the baseline biodiversity of two key groups, birds and bees, on 12-13 June, 2017. This assessment was conducted in the six blocks composed of fescue and brome grass that will be used as controls once other treatments are applied in surrounding blocks (Fig. 1). In each block, we conducted one 200m radius bird point count (BPC) shortly after sunrise. We used modified pan-traps (i.e. bee bowls) painted yellow, blue, and white to assess the bee community. We placed bee bowls of each color at four locations within each block and collected after 24 hours. All specimens were identified at the genus level.

Bird Point Count Results: 85 individuals representing 28 species

Many of the bird species detected are considered generalists that are commonly seen in many agricultural settings in the Midwest (Fig. 2). Grassland species such as Bobolink *(Dolichonyx oryzivorous*; Fig. 3), Dickcissel (*Spiza americana*), Eastern Meadowlark (*Sturnella magna*), and Grasshopper Sparrow (*Ammodramus savannarum*) were among those detected. These species are of conservation concern because their populations have been declining over the last half century, primarily due to habitat loss.

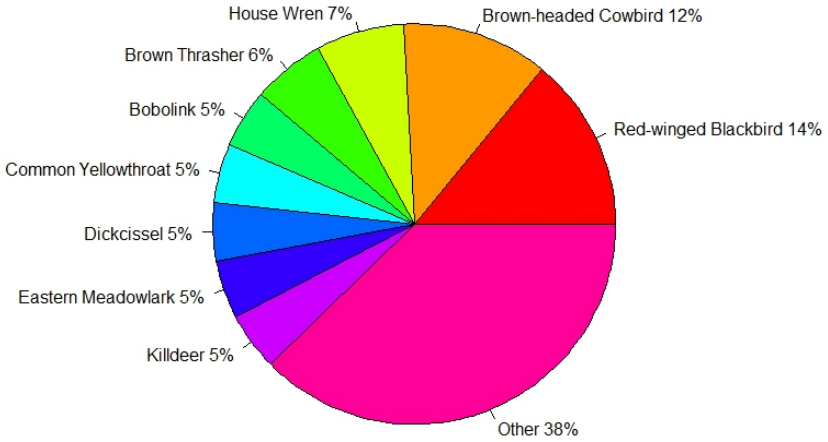

Fig. 2. Bird species detected in preliminary assessment. Other includes American Crow, American Goldfinch, American Robin, Blue Jay, Common Grackle, Eastern Kingbird, Eastern Wood-Peewee, Gray Catbird, Grasshopper Sparrow, Hairy Woodpecker, Henslow's Sparrow, Mourning Dove, Northern Cardinal, Red-bellied Woodpecker, Red-headed Woodpecker, Song Sparrow, Unknown Sparrow, and Yellow-billed Cuckoo.

Fig. 3. Bobolink (*Dolichonyx oryzivorus*), a species of conservation concern.

Bee Bowl Trap Results: 129 individuals representing 7 genera

Many of the bees collected in the bee bowls (Fig. 4, 5) are considered "sweat bees" (e.g. *Lasiogolossum* [Fig. 6], *Augochlorella*) with varied coloration, including metallic green sweat bees (*Agapostemon*). In addition to these smaller species, we collected a few more robust sized bumble bees (e.g. *Bombus*). Note that this is an underestimate of diversity, as several species could be included within each genus, especially for *Lasioglossum*, which is composed of ~280 species in North America. Many of these species are ground-nesters and may have nests within these blocks.

Fig. 4. Bee bowls in a fescue-brome block at research site. Each block received four stations.

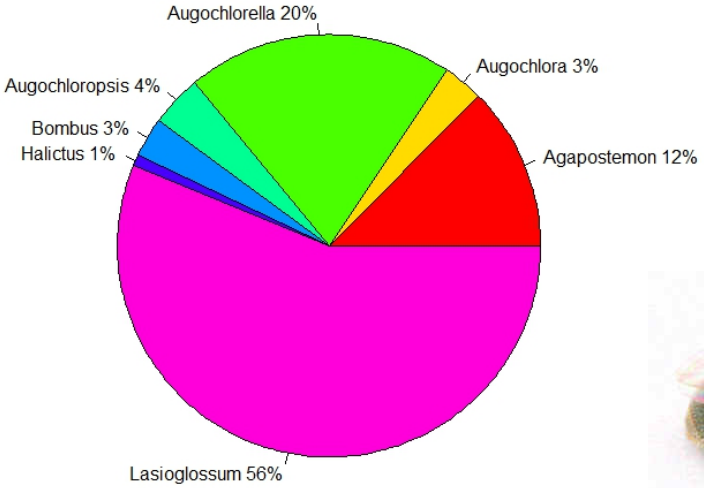

Fig. 5. Bee genera collected in fescue-brome blocks at the research site in June, 2017.

Fig. 6. Most commonly bee collected: *Lasioglossum* sp.

What does it mean?: In control blocks, we observed species commonly observed in the Midwest in landscapes in which specific conservation practices are not executed. Going forward, we expect the addition of a more diverse prairie plant community to improve upon this baseline community, with subsequent increases in bird and bee diversity and abundance.

Other: We also established a project website for the reporting of project progress and findings: https://www.nrem.iastate.edu/landscape/content/pigs-and-prairies-evaluating-biodiversity-impacts-prairie-restoration-biogas-production

Next Steps: Following the application of the prairie treatments, research sites will be instrumented with devices for monitoring seasonal bird occupancy (i.e., Autonomous Recording Units) and amphibian, small mammal, and reptile occupancy (i.e., cover boards). Beginning in May 2018, we will conduct bi-weekly assessments of all taxa through the end of July, including all blocks to which the various restoration treatments are applied. We will also monitor vegetation diversity and structure in July before the expected harvest start date of July 15. Using the Environmental Defense Fund's protocol, we will assess monarch butterfly habitat quality during vegetation surveys.

Partners: Roeslein Alternative Energy, Smithfield Foods, U.S. Fish and Wildlife Service, National Wild Turkey Federation, Eastern Tallgrass Prairie and Big Rivers LLC, Pure Air Natives, Environmental Defense Fund